ROLLING RETURN TO NEUTRAL DEPRESSABLE CONTROL

FIELD OF THE DISCLOSURE

[0001] The present disclosure relates to a machine. An embodiment of the present disclosure relates to a control which may be rotated or depressed and which returns to a neutral angle and position.

BACKGROUND

[0002] Controls may be provided for input by a user. One type of control may be designed to be actuated by a user's finger in a rotational motion. This type of user actuated control may also be referred to as a finger control, fingertip control, rocker, thumbwheel, or wheel.

SUMMARY

[0003] According to an aspect of the present disclosure, a user actuated control may include a base, a roller, a magnet, a sensor, and a spring assembly. The roller may be movably connected to the base so as to allow rotational displacement between a neutral angle and a maximum angle and linear displacement between a neutral position and a depressed position. The magnet may be connected to the roller and positioned to rotate with rotational displacement of the roller. The magnet may be positioned to linearly displace with linear displacement of the roller. The sensor may be connected to the base and configured to measure both the orientation and intensity of a magnetic field produced by the magnet and passing through the sensor. The spring assembly may be connected to the roller and the base and configured to exert a torque on the roller in the direction of the neutral angle when the roller is rotationally displaced from the neutral angle. The spring assembly may also be configured to exert a force on the roller in the direction of the neutral position when the roller is linearly displaced from the neutral position.

[0004] According to another aspect of the present disclosures, the roller may be movably connected to the base so as to allow rotational displacement between a minimum angle and the neutral angle, the neutral angle positioned between the minimum angle and the maximum angle.

[0005] According to another aspect of the present disclosures, the roller may be movably connected to the base so as to allow continuous rotational displacement between the minimum angle and the maximum angle.

[0006] According to another aspect of the present disclosures, the sensor may be configured to provide a rotation signal indicative of the rotational displacement of the roller based on the measured orientation of the magnetic field and to provide a linear signal indicative of the linear displacement of the roller based on the measured intensity of the magnetic field.

[0007] According to another aspect of the present disclosures, the sensor may be a Hall Effect sensor.

[0008] According to another aspect of the present disclosures, the shield may be positioned under the roller and configured to allow linear displacement of the roller to the depressed position when the roller is at the neutral angle. The shield may be configured to block linear displacement of the roller to the depressed position at a first angle of the roller. The shield may be configured to block linear displacement of the roller to the depressed position at a second angle of the roller. The first angle is between the maximum angle and the neutral angle and the second angle is between the neutral angle and the minimum angle.

[0009] According to another aspect of the present disclosures, the shield may be configured to allow linear displacement of the roller to the depressed position when the roller is at the maximum angle. The shield may be configured to allow linear displacement of the roller to the depressed position when the roller is at the minimum angle.

[0010] According to another aspect of the present disclosures, the shield may be configured to block linear displacement of the roller to the depressed position when the roller is at the maximum angle and the shield is configured to block linear displacement of the roller to the depressed position when the roller is at the minimum angle.

[0011] According to another aspect of the present disclosures, a user actuated control may include a base, a roller, a top stop, a bottom stop, a front stop, a rear stop, a magnet, a sensor, and a spring assembly. The roller may be positioned above the base and pivotally and slidably connected to the base about a pin disposed in a slot having a slot length. The top stop may be positioned to block further linear displacement of the roller in a first linear direction when the roller is at a neutral position. The bottom stop may be positioned to block further linear displacement of the roller in a second linear direction opposite the first linear direction when the roller is at a depressed position. The front stop may be positioned to block further rotational displacement of the roller in a first rotational direction when the roller is at a maximum angle. The rear stop may be positioned to block further rotational displacement of the roller in a second rotational direction opposite the first rotational direction when the roller is at a minimum angle. The magnet may be connected to the roller and positioned to rotate with rotational displacement of the roller and linearly displace with linear displacement of the roller. The sensor may be connected to the base and configured to measure both the orientation and intensity of a magnetic field produced by the magnet and passing through the sensor. The spring assembly may be connected to the roller and the base and positioned to exert force on the roller in the first linear direction when the roller is at the depressed position, torque on the roller in the first rotational direction when the roller at the minimum angle, and torque on the roller in the second rotational direction when the roller is at the maximum angle.

[0012] According to another aspect of the present disclosures, the top stop may be a portion of the slot at a first end of the slot in the direction of the slot length where the pin contacts the slot when the roller is at the neutral position. The bottom stop is a portion of the slot at a second end of the slot opposite the first end of the slot in the direction of the slot length where the pin contacts the slot when the roller is at the depressed position.

[0013] According to another aspect of the present disclosures, the top stop may be a portion of the slot at an end of the slot in the direction of the slot length where the pin contacts the slot when the roller is at the neutral position. The bottom stop may be a portion of the base which contacts the roller when the roller is at the depressed position.

[0014] According to another aspect of the present disclosures, the spring assembly may be positioned to exert a first force on the roller in the first linear direction when the roller is at the depressed position. The spring assembly may be positioned to exert the equivalent of a second force on a